

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 15, 18, and 30-34 are currently pending, Claims 15 and 18 having been amended, Claims 28-29 having been cancelled, and Claims 30-34 having been added by the present amendment. The changes and additions to the claims are supported by the originally filed specification, for example, on page 37, line 6 to page 43, line 23; page 56, line 17 to page 58, line 18; page 65, line 11 to page 68, line 12; page 28, line 14 to page 29, line 8; page 23, line 15 to page 24, line 9; page 27, line 9 to page 28, line 13; and Figures 6, 10-11, and 14. Thus, no new matter has been added.

In the outstanding Office Action, Claims 15, 18-19, and 25-27 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sugo et al (U.S. Patent No. 5,308,467, hereinafter “Sugo”) in view of Liang et al (U.S. Patent No. 6,649,037, hereinafter “Liang”).

The Advisory Action indicates that Claims 15, 18, and 28 are rejected but does not appear to provide any explanation on the grounds for rejecting Claim 28.

Applicants thank the examiner for the courtesy of an interview with Applicants’ representatives on May 13, 2010. During the interview, differences between the amended claims and the applied art with regard to the Amendment filed on November 23, 2009, were discussed. No formal agreement was reached, and the examiner indicated further consideration and/or search may be necessary.

Further to Applicants’ Amendment filed on April 26, 2010, the present Supplemental Amendment amends independent Claims 15 and 18; cancels Claims 28-29; and adds new Claims 30-36 based on the discussion during the interview on May 13, 2010.

Further to the remarks of April 26, 2010 and to the present Supplemental Amendment, Applicants respectfully submit that independent Claims 15 and 18, and claims depending therefrom, patentably define over Sugo and Liang. Therefore, Applicants respectfully request the rejections of Claims 15 and 18, and claims depending respectively therefrom, be reconsidered and withdrawn.

With respect to the rejection of Claim 15 under 35 U.S.C. §103(a), Applicants respectfully traverse this ground of rejection and submit that the present amendment to Claim 15 overcomes this ground of rejection. Amended Claim 15 recites, *inter alia*,

wherein, a water inlet to supply water and a water outlet to discharge water are installed in each of the deionization compartments, the concentration compartments and the electrode compartments,

wherein, in each of the deionization compartments, a plurality of sheets of anion-exchange fibrous materials and a plurality of sheets of cation-exchange fibrous materials are alternately stacked in a direction intersecting a water-passing direction such that a sheet of anion-exchange fibrous material and a sheet of cation-exchange fibrous material are in contact with one another and opposite ends of each of the sheets of anion-exchange fibrous material and the sheets of cation-exchange fibrous material are in contact with each of an anion-exchange membrane and a cation-exchange membrane for forming the respective deionization compartment, and

the anion-exchange fibrous material and the cation-exchange fibrous material are obtained by introducing ion-exchange groups onto a substrate using radiation-induced graft polymerization.

Applicants submit that Sugo and Liang fail to disclose or suggest at least these features of amended Claim 15.

Sugo describes an electrically regenerable demineralizing apparatus which uses ion exchangers that are produced by radiation-initiated graft polymerization and that are packed in the demineralizing compartment of an electrode dialyzer (see Sugo abstract). The electrically regenerable demineralizing apparatus of Sugo may use a mosaic ion exchanger that consists of alternately arranged cation- and anion-exchange groups (see Sugo abstract).

The Office Action of August 24, 2009 acknowledges that Sugo does not disclose or suggest “in a de-ionization compartment, one or more sheets of anion-exchange fibrous materials and one or more sheets of cation-exchange fibrous materials are alternately laminated on one another,” as recited in previously presented Claim 15. Rather, the Office Action relies on Liang to remedy the deficiencies of Sugo with regard to previously presented Claim 15.

Liang describes an electrodeionization apparatus and method for purifying a fluid (see Liang abstract). The electrodeionization apparatus of Liang includes at least one ion depletion compartment, a first layer of a first ion exchange material positioned in the at least one ion depletion compartment, a second layer of a second ion exchange material positioned adjacent and downstream of the first material, and a third layer comprising an anion- and cation-exchange material positioned adjacent to and downstream of the second layer (see Liang, column 2, lines 38-47).

The Office Action appears to assert that an ion layer 61, a cation layer 63, and a mixed ion exchanging material 67 of Liang correspond to “in a deionization compartment, one or more sheets of anion-exchange fibrous material and one or more sheets of cation-exchange fibrous material are alternately laminated on one another,” as recited in previously presented Claim 15. (See August 24, 2009 Office Action, page 2). Liang shows, in Figures 3, 5-7, 9, and 12, multiple depletion compartments in fluid communication with each other having varying arrangements. However, Liang merely shows, in Figure 6, a single depletion compartment having anion layers 61 and cation layers 63 in fluid communication with a separate depletion compartment containing a single layer of mixed ion exchange material 67. Accordingly, Liang does not describe *in each of the depletion compartments*, a plurality of sheets of anion-exchange fibrous material and a plurality of sheets of cation-exchange fibrous

material alternately stacked in a direction intersecting a water-passing direction such that a sheet of anion-exchange fibrous material and a sheet of cation-exchange fibrous material are in contact with one another.

Furthermore, Liang describes a depletion compartment bounded by ion-permeable membranes.¹ Liang, in Figures 4A-4F, shows the depletion compartment 100 having ion exchange resin material positioned in the ion-depleting compartment 100 in a central space formed between an anion-permeable membrane 126 and a cation-permeable membrane 124.² Liang also shows, in Figures 4A-4F, space between the first anion exchange resin material layer 128 and the second cation exchange resin material layer 130 and the exchange resin material layers 128, 130 and the membranes 124, 126.

Accordingly, Liang merely describes the ion-depleting compartment 100 being **bounded** by membranes 124, 126 and the layers of ion exchange resin material being positioned **between** the membranes 124, 126 and having spaces therebetween. However, Liang does not describe a plurality of sheets of first anion exchange resin material 128 and a plurality of sheets of second cation exchange resin material layer 130 alternately stacked such that a sheet of anion exchange resin material 128 and a sheet of cation exchange resin material layer 130 are **in contact** with one another and opposite ends of each of the sheets are **in contact** with each of an anion-exchange membrane 126 and a cation-exchange membrane 124 for forming the ion-depletion compartment 100.

Therefore, Liang does not explicitly disclose or suggest “***in each of the deionization compartments, a plurality of sheets of anion-exchange fibrous materials and a plurality of sheets of cation-exchange fibrous materials are alternately stacked*** in a direction intersecting a water-passing direction ***such that a sheet of anion-exchange fibrous material***

¹ See Liang, column 6, lines 17-20.

² See Liang, column 12, lines 19-25.

and a sheet of cation-exchange fibrous material are in contact with one another and opposite ends of each of the sheets of anion-exchange fibrous material and the sheets of cation-exchange fibrous material are in contact with each of an anion-exchange membrane and a cation-exchange membrane for forming the respective deionization compartment,” as recited in amended Claim 15 and also does not provide the advantages described above.

Accordingly, Applicants respectfully submit that amended Claim 15 (and all associated dependent claims) patentably distinguishes over Sugo and Liang, either alone or in proper combination.

With respect to the rejection of Claim 18 under 35 U.S.C. §103(a), Applicants respectfully traverse this ground of rejection and submit that the present amendment overcomes this ground of rejection. Amended Claim 18 recites, *inter alia*

wherein, a water inlet to supply water and a water outlet to discharge water are installed in each of the deionization compartments, the concentration compartments and the electrode compartments,

wherein, in each of the deionization compartments, a plurality of sheets of anion-exchange fibrous materials and a plurality of sheets of cation-exchange fibrous materials are alternately stacked in a direction intersecting a water-passing direction such that a sheet of anion-exchange fibrous material and a sheet of cation-exchange fibrous material are in contact with one another, and opposite ends of each of the sheets of anion-exchange fibrous material and the sheets of cation-exchange fibrous material are in contact with each of a sheet of anion-exchange fibrous material and a sheet of cation-exchange fibrous material which are respectively disposed in parallel with the surface of the anion-exchange membrane and the surface of the cation-exchange membrane for forming the respective deionization compartment, and

the anion-exchange fibrous material and the cation-exchange fibrous material are obtained by introducing ion-exchange groups onto a substrate using radiation-induced graft polymerization.

Applicants submit that Sugo and Liang fail to disclose or suggest at least these features of amended Claim 18.

The Advisory Action of February 24, 2010 appears to assert that the feature “a sheet of anion exchange fibrous material and a sheet of cation exchange fibrous material which are respectively disposed in parallel with the surface of the anion exchange membrane and the surface of the cation exchange membrane,” of previously presented Claim 18 “merely produces a thicker anion exchange membrane or layer.” (See February 24, 2010 Advisory Action, pages 3-4). In addition, it was asserted during the interview that the anion membrane 126 and the cation membrane 124 of Liang respectively correspond to “a sheet of anion exchange fibrous material and a sheet of cation exchange fibrous material which are respectively disposed in parallel with the surface of the anion exchange membrane and the surface of the cation exchange membrane,” as recited in previously presented Claim 18.

In a non-limiting example of the invention defined by Claim 18, the specification describes that the claimed “cation-exchange membrane” is a cation exchange membrane C (made by Tokuyama Corporation: Neosepta CMB) and the claimed “anion-exchange membrane” is an anion exchange membrane A (made by Tokuyama Corporation: Neosepta AHA). (See specification, page 56, lines 19-22). (See Specification, page 34, lines 14-20). In the non-limiting example of the invention defined by Claim 18, the specification further describes the “cation exchange fibrous material” and the “anion exchange fibrous material” as a woven fabric or a nonwoven fabric. (See Specification, page 29, lines 6-8).

Liang describes the anion exchange resin as DOWEXTM MARATHONTM A and the cation exchange resin as MARATHONTM C.³ However, Liang does not describe the anion membrane 126 or the cation membrane 124 as being made of the same material as the anion or cation exchange resin. Liang does not describe varying the thickness of the anion membrane 126 or the cation membrane 124. Furthermore, Liang does not describe the anion

³ See Liang, column 14, line 62 to column 15, line 15.

membrane 126 (as a sheet of anion exchange fibrous material) and the cation membrane 124 (as a sheet of cation exchange fibrous material) as being obtained by introducing ion-exchange groups onto a substrate using radiation-induced graft polymerization.

Therefore, Liang clearly does not disclose or suggest “**a sheet of anion-exchange fibrous material and a sheet of cation-exchange fibrous material which are respectively disposed in parallel with the surface of the anion-exchange membrane and the surface of the cation-exchange membrane** for forming the respective deionization compartment, and **the anion-exchange fibrous material and the cation-exchange fibrous material are obtained by introducing ion-exchange groups onto a substrate using radiation-induced graft polymerization,**” as recited in amended Claim 18.

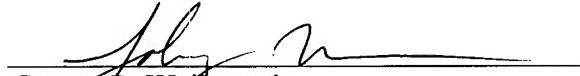
Accordingly, Applicants respectfully submit that amended Claim 18 (and all associated dependent claims) patentably distinguishes over Sugo and Liang, either alone or in proper combination.

The present amendment also sets forth new Claims 30-34 for examination on the merits. No new matter has been added. It is respectfully submitted that these more detailed features are not disclosed or suggested by the applied references.

Consequently, in light of the above discussion and in view of the present amendment, the outstanding grounds for rejection are believed to have been overcome. The present application is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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